

CLAIMS:

1. An imaging system (46), shown in Fig. 3, which defines an optical path therein, for capturing an image from the image-bearing radiation (38), the imaging system comprising:
5 a solid radiation bearing detector (40) disposed in the optical path, shown in Fig. 4, comprising a very thin, about 50 to 100 micro-metre thick, and very heavy scintillator (50) with a density greater than 6, which efficiently converts the image-bearing radiation (38) into a visible light spectrum (116) with a high spatial accuracy;
a photocathode (42, 102), shown in Figs. 3 and 8 respectively, disposed within the
10 camera housing (94) along the optical path to convert the converted radiation into a stream of electrons (116) representative of the image-bearing radiation (38);
an image amplifier (112, 114) disposed in the stream of electrons (116) such that image amplifier (112, 114) electrostatically accelerates the stream of electrons (116); and
an amplified detector (96) disposed after the image amplifier (112, 114) and, upon
15 input of the stream of electrons (116), being adapted to generate secondary electrons to further amplify the image represented thereby such that the amplified detector (96) then converts secondary electrons into an electronic signal representative of the image.
2. A radiation imaging system (30), shown in Fig. 3, comprising a radiation source
20 (32) that projects radiation (35) towards an object (36), thereby creating image-bearing radiation (38) from the object (36) towards the imaging system (46); and
an imaging system (46), which according to claim 1 has a solid radiation bearing detector (40) shown in Fig. 4, comprising a very thin, about 50 to 100 micro-metre thick, and very heavy scintillator (50) with a density greater than 6, which efficiently converts the
25 image-bearing radiation (38) into a visible light spectrum (116) with a high spatial accuracy.
3. The imaging system (46) according to claim 2, wherein the image amplifier (112, 114) is adapted to selectively electronically de-magnify the image-bearing radiation (38)
30 and thus adjust a resolution of the image.

4. The imaging system (46) according claim 3, wherein the image amplifier (112, 114) is dynamically selectable to adjust de-magnification so as to govern an area of an object (36) to be imaged.
- 5 5. The radiation imaging system (30) shown in Fig. 6, according to claim 2, wherein the radiation source (62) is adapted to electronically shift between a plurality of dynamically selectable positions (66, 68) such that the image transmitted by the image-bearing radiation (74, 76) changes for each of the plurality of positions.
- 10 6. The radiation imaging system (30) according to claim 5, wherein the radiation source (62) electronically shifts between two dynamically selectable positions (66, 68) to generate stereo pairs of three-dimensional images and to select the line-of-view of an object of interest to bypass other shadowing objects.
- 15 7. The radiation imaging system (30) according to claim 5, wherein the radiation source is continuously deflected producing a plurality of radiation shadows that can be interactively "focussed" to various levels within the object (36, 84).
8. The radiation imaging system (30) according to claim 5, wherein the radiation
20 source projects divergent rays of the radiation and has a spot size smaller than a resolution of the radiation imaging system (30).
9. The imaging system (46) according to claim 1, further comprising:
filtering means for filtering the image-bearing radiation (38) consecutively through
25 a plurality of filters (40) thus creating a plurality of sub-images;
analysis means to distinguish between the changes of sub-images due to the filtering of the radiation and due to the object motion during and between the exposures; and
correcting means for correcting the changes of the plurality of sub-images due to the object motion and correlating the plurality of sub-images into a colour image.

10. The radiation imaging system (30) according to claim 2, wherein the imaging system (30) corrects for motion in a colour image generated by capturing two or more consecutive sub-images, the imaging system (30) further comprising:

calculation means for calculating the shift vector between the two or more
5 consecutive sub-images, using lists of characteristic quantities computed from the images;

mapping means for mapping a coordinate transformation of a first image into a second image of the two or more consecutive sub-images;

computing means for computing corresponding transformations of the two or more consecutive sub-images by interpolation; and

10 reconstruction means for reconstructing the image from the two or more consecutive sub-images.

11. The radiation imaging system (30) according to claim 10, further comprising processing means for differentiating between foreground and non-uniform background in
15 the plurality of radiation shadows such that the non-uniform background can be subtracted from the image.

12. The radiation imaging system (30) according to claim 11, wherein the processing means is adapted to replace one background with a second background.

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13. The imaging system (46) according to claim 1, wherein the amplified detector (96) has a radiation-stable "dead layer" created by ion implantation.

14. The imaging system (46) according to claim 2, further comprising optic means (52)
25 disposed within the camera housing (46) for collecting the image-bearing radiation (38) and defining the optical path, where the optic means is integral with the scintillator (50).

15. The radiation imaging system (30) according to claim 2, wherein the scintillator (50) has a density of at least 7.5 grams per cubic centimetre.

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16. The imaging system (80), shown in Fig. 7, according to claim 1, comprising

a solid radiation bearing detector (40), which is a flexible optic light guide system (92, 82 and 88) made of many tiny about 5 micro-metre diameter fibres, and a light source (90) thereby creating image bearing radiation (110) from the reflected light from the object (84);

5 a photocathode (102), shown in Figs. 7 and 8, which converts the radiation bearing light (110), reflected from object (84) and transmitted through the fibre optic light guide system (92, 82 and 88), into streams of electrons (116), which can be gated according to their arrival time at the high voltage electrodes (112);

an image amplifier (112, 114) disposed in the stream of electrons (116) such that
10 the image amplifier (112, 114) electrostatically accelerates or decelerates the stream of electrons (116) according to their arrival time; and

an amplified detector (96) disposed after the image amplifier (112, 114) and, upon input of the stream of electrons (116), being adapted to generate secondary electrons to further amplify the image represented thereby such that the amplified detector (96) then
15 converts secondary electrons into an electronic signal representative of the image.

17. The imaging system (80) according to claim 16, wherein the photocathode (102) is fabricated of gallium-arsenide, which, with the scintillator removed, converts the infra-red radiation bearing light (110), reflected from the object (84) and transmitted through
20 the fibre optic light guide system (92, 82 and 88), into streams of electrons (116), which are gated according to their arrival time at the high voltage electrodes (112), to analyse the time dependent images at the detector (96), after an initial flash from the light source (90) has been emitted and reflected.

25 18. The imaging system (80) according to claim 16, wherein the image amplifier (112, 114) is adapted to selectively electronically magnify the image-bearing radiation (110) as measured at the detector (96) and thus adjust a resolution of the image.

19. The imaging system (80) according to claim 18, wherein the image amplifier (112)
30 114) is dynamically selectable to adjust magnification so as to govern an area of an object (84) to be imaged.

20. The imaging system (46) according to claim 1, with the scintillator removed, further comprising:

filtering means for filtering the image-bearing radiation consecutively through a plurality of wavelength filters (40) which allows only light within preselected ranges of wavelengths to pass, so that a "coloured" image can be formed using these sub-images of different wavelengths;

analysis means to distinguish between the changes of sub-images due to the filtering of the light of different wavelengths and due to the object motion during and between the exposures; and

correcting means for correcting the changes of the plurality of sub-images due to the object motion and correlating the plurality of sub-images into a colour image (Fig. 10).

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